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REVIEW OF A PROPOSED DEVELOPMENT FOR THE EAST DISTRICTS AT LINGAN COLLIERY

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REVIEW OF A PROPOSED DEVELOPMENT FOR THE EAST DISTRICTS AT LINGAN COLLIERY

by

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ABSTRACT

At the request of the Cape Breton Development Corporation, a proposal for future development on the east side of Lingan Colliery was reviewed with respect to the stability of the roadways serving the proposed extraction panels.

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ÉTUDE D'UNE PROPOSITION RELATIVE AU DÉVELOPPEMENT DU QUARTIER EST DE LA HOUILLÈRE LINGAN

par

P. Cain*

RÉSUMÉ

À la demande de la Société de développement du Cap-Breton, on a fait l'étude d'une proposition relative au développement du quartier est de la houillère Lingan en fonction de la stabilité des voies desservant les panneaux d'extraction proposés.

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INTRODUCTION

The large volumes of intake air lost through the wastes into the return airstream has been an expensive inconvenience for many years at Lingan Colliery, especially on the east side panels. The traditional response has been to employ a 'cundy' ventilation system, routing the return air to an exhausted updip panel (1). This method is only applicable where production panels are not operating adjacent to each other. Plans to maintain the production quotas at Lingan colliery in March 1984 necessitated the operation of two adjacent panels on the east side, 8E and 9E. This dictated a change in the conventional method of ventilating these districts.

A proposal for future extraction on the east side of the pit was presented to CBCRL (Figure 1), along with three questions concerning its suitability.

1. What is the appropriate width of pillar between the 9E maingate and the main intake airway?
2. Will the proposed system of props, bars and truss bolts be able to support the 4.5 m wide rectangular in-seam roadways for the required length of time (up to five years)?
3. What support system should be implemented in the 9E maingate to allow reuse of that roadway?

The following is a summary of the authors comments on the problem.

PILLAR SIZE

The ultimate choice of pillar size between the 9E maingate and the main intake, the eventual maingate of the proposed 10E retreat wall, will be a compromise between the anticipated stress conditions and the maximum length of the 10E faceline required to ensure rapid retreat and minimise damage to the roadways caused by the 10E front abutment. Since CBCRL cannot make production related decisions, the examination of pillar size was restricted to the anticipated stress conditions and their effects on the intake airway.

Stress distribution in the ribside of the 9E maingate i.e. in the area in which the intake airway will be driven, can be approximated using the hypothetical distribution of stress put forward by Wilson (2). A computer

solution was used to generate a plot of hypothetical vertical stress against distance into the ribside (Figure 2). The parameters used to obtain this curve are based on coalfield data and given in Table 1.

The curves in Figure 2 illustrate the hypothetical stress and the estimated cover load. At approximately 80 m into the ribside, the hypothetical vertical stress is close to the cover load. At this distance from the 9E panel, the proposed 9E intake airway (later to be the 10E maingate) would not be subjected to excessive vertical stress above that expected from the cover load. Since Prince Mine retreat panels of approximately this length (in fact, 90 m) at a rapid rate, this might be an optimum face length for the 10E panel.

Table 1 - Parameters used in the calculation of the hypothetical vertical stress distribution

Parameter	Value
Strata Density	2600 Kg/m^2
Depth	579 m
Width	220 m
Extracted Height	3.6 m
Coal Strength (intact)	11 MPa
Coal Strength (failed)	0.2 MPa
Lateral Support Resistance	0.1 MPa
Triaxial Stress Factor	4
Yield Criterion	Yield in roof, seam and floor

SUPPORT IN RECTANGULAR ROADWAYS

In recent times there has been little use of rectangular roadways at depth in the Sydney Coalfield. Consequently, very little is known about their support requirement. Although rectangular roadways are used at

comparable depths elsewhere in the world, these have generally had a life expectancy of much less than the five years required of the roadways proposed in the Lingan development.

One solution to the problem would be the driveage of an experimental section of instrumented rectangular roadway in which a variety of support systems could be installed and monitored, preferably in an area where changes in the stress regime are anticipated e.g. driven in a current rib pillar at an angle to bring it closer to the abutment zone of the existing panel.

SUPPORT IN THE 9E MAINGATE

The support system required for this roadway, specifically the pack, requires great attention. Should this roadway become so badly deformed that the 10E panel becomes impossble to work, the only remaining option would be to retreat the centre panel between the proposed 10E and 11E panels.

The proposed system for the support of this roadway to allow extraction of the full width of coal between it and the intake airway is shown in Figure 3. Under the elevated stress conditions expected in the front abutment zone of the 10E panel, the mode of failure anticipated, primarily the result of the extrusion of the coal ahead of the wall face, is shown in Figure 4. An alternative arrangement utilising a yielding coal pillar between the 10E panel and the existing gateroad is shown in Figure 5. This is fairly common in Europe, but requires substantial support in the 9E maingate ahead of the 10E face, and the pre-driveage of the 'snickets'. However, its effective use elsewhere is a fair indicator of the methods chance of success.

CONCLUSIONS

The proposed extraction method could probably be applied effectively as long as the 10E panel was at least 80 m wide, and the support of long-life rectangular roadways is fully evaluated.

A major disadvantage of the proposal is the disruption of the current mining method and the additional work required to drive and maintain the rectangular gateroads.

A longer term approach to the problem of operating adjacent panels in the coalfield would be the consideration of methods to seal the waste areas and to prevent the excessive air leakage currently encountered, for example, the use of monolithic pumped packs.

POSTSCRIPT

This development plan was eventually discarded in favour of the use of monolithic pumped packs in the 9E maingate. Trials started in March 1985, some time after the 9E panel commenced production.

REFERENCES

1. Cain, P. et. al. "Preliminary report on studies into gob leakage in the Sydney Coalfield"; CANMET, Divisional Report ERP/CRL 84-43(OP).
2. Wilson, A.H. "Stability of underground workings in soft rocks of the coal measures"; International Journal of Mining Engineering; (Ed. I.W. Farmer, Pub. Chapman and Hall); vol. 1, No. 2; July 1983.

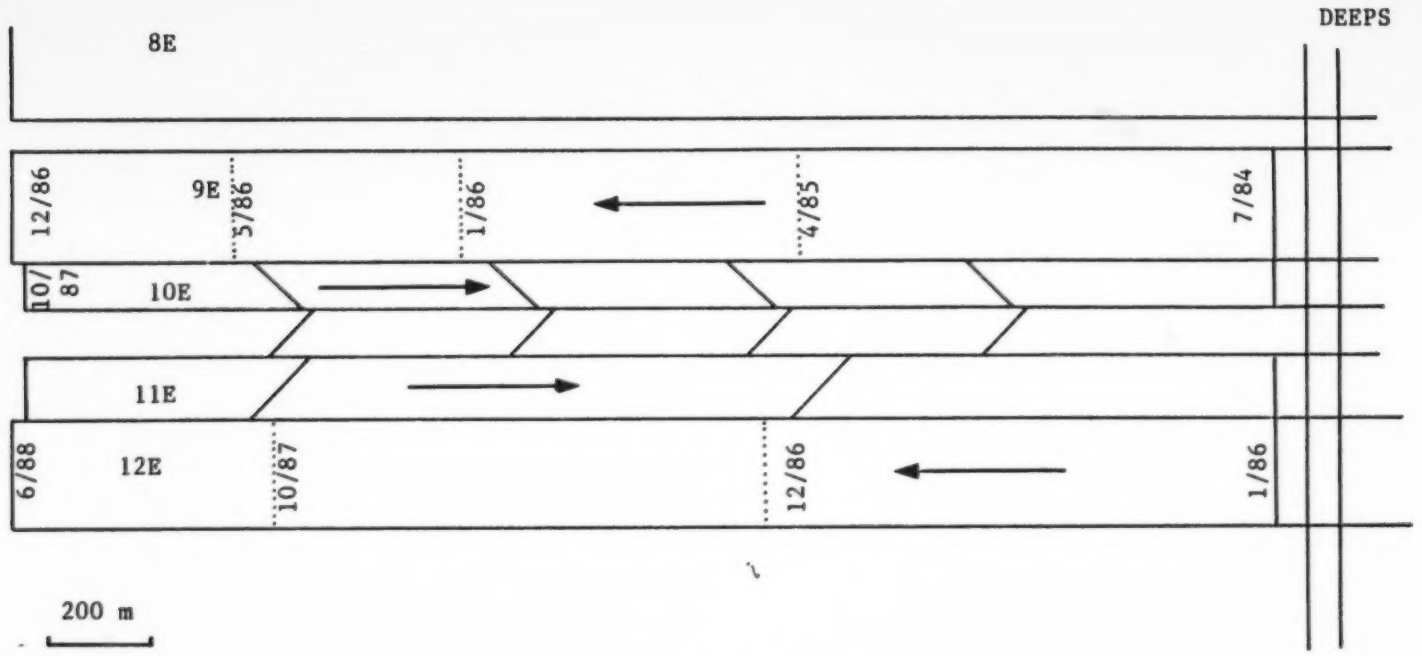

Figure 1 - Proposal for extraction on the east side of Lingan Colliery

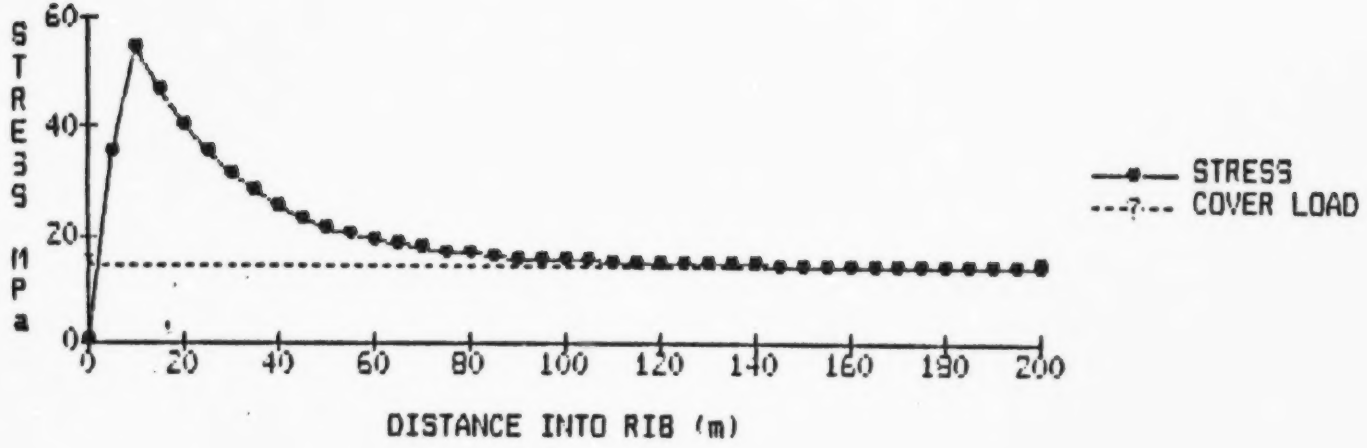

Figure 2 - Stress distribution in the ribside of 9E panel, Lingan Colliery

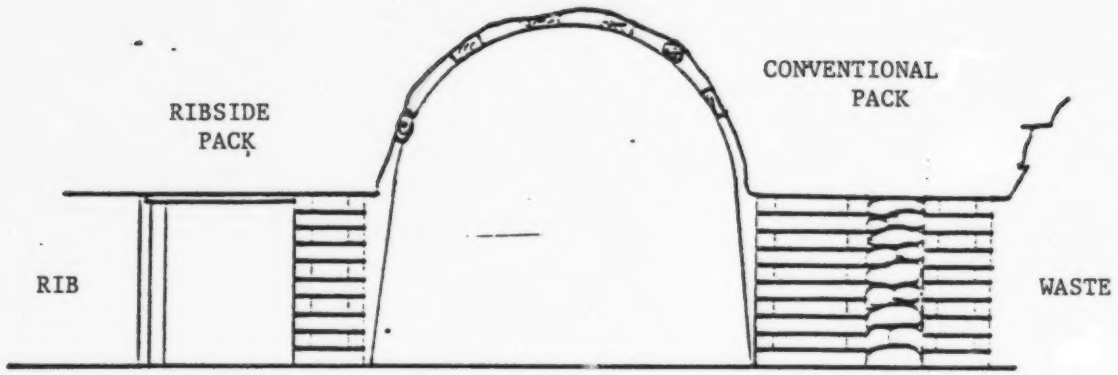

Figure 3 - Proposed support system in the 9E maingate

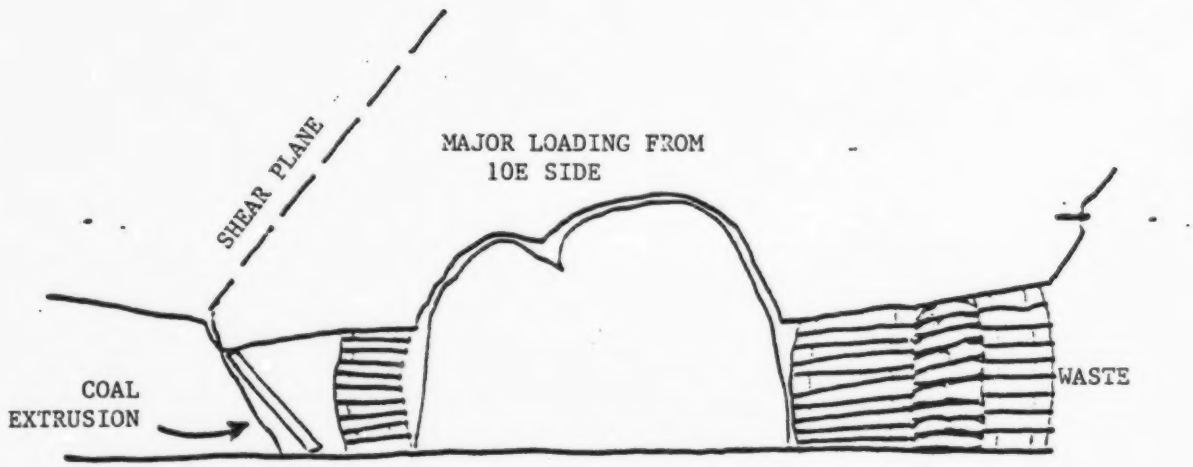

Figure 4 - Anticipated mode of failure of the proposed support system in the 9E maingate

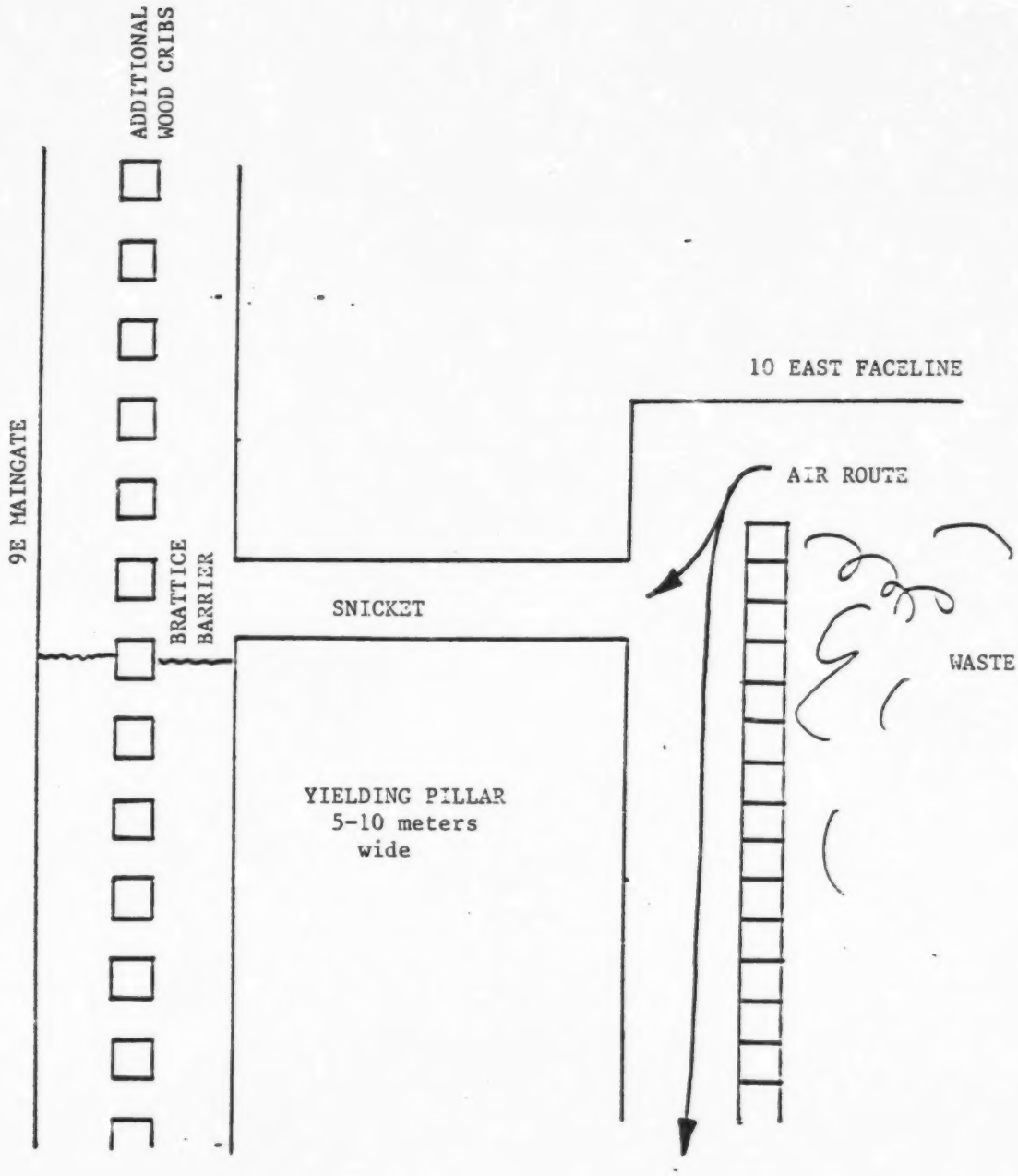

Figure 5 - Possible alternative support system